

**Fundamental Biology Program Office**

**STS-107**

**Project Phase A/B Review**

**May 25, 2000**

**NASA Ames Research Center**



## Agenda



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- |  |                     |
|--|---------------------|
| <b>1) Introduction</b>                 | <b>Stan Farkas</b>  |
| <b>2) Overview</b>                     | <b>Stan Farkas</b>  |
| <b>3) Goals &amp; Objectives</b>       | <b>Stan Farkas</b>  |
| <b>4) Project Requirements</b>         | <b>Stan Farkas</b>  |
| <b>5) Experiment Assignment Status</b> | <b>Stan Farkas</b>  |
| <b>6) Payload Configuration</b>        | <b>Stan Farkas</b>  |
| <b>7) Science</b>                      | <b>Paula Dumars</b> |
| <b>8) Hardware Status</b>              | <b>Rick Hoopes</b>  |
| <b>9) Operations</b>                   | <b>Rick Hoopes</b>  |
| <b>10) Crew Training</b>               | <b>Steve Ormsby</b> |

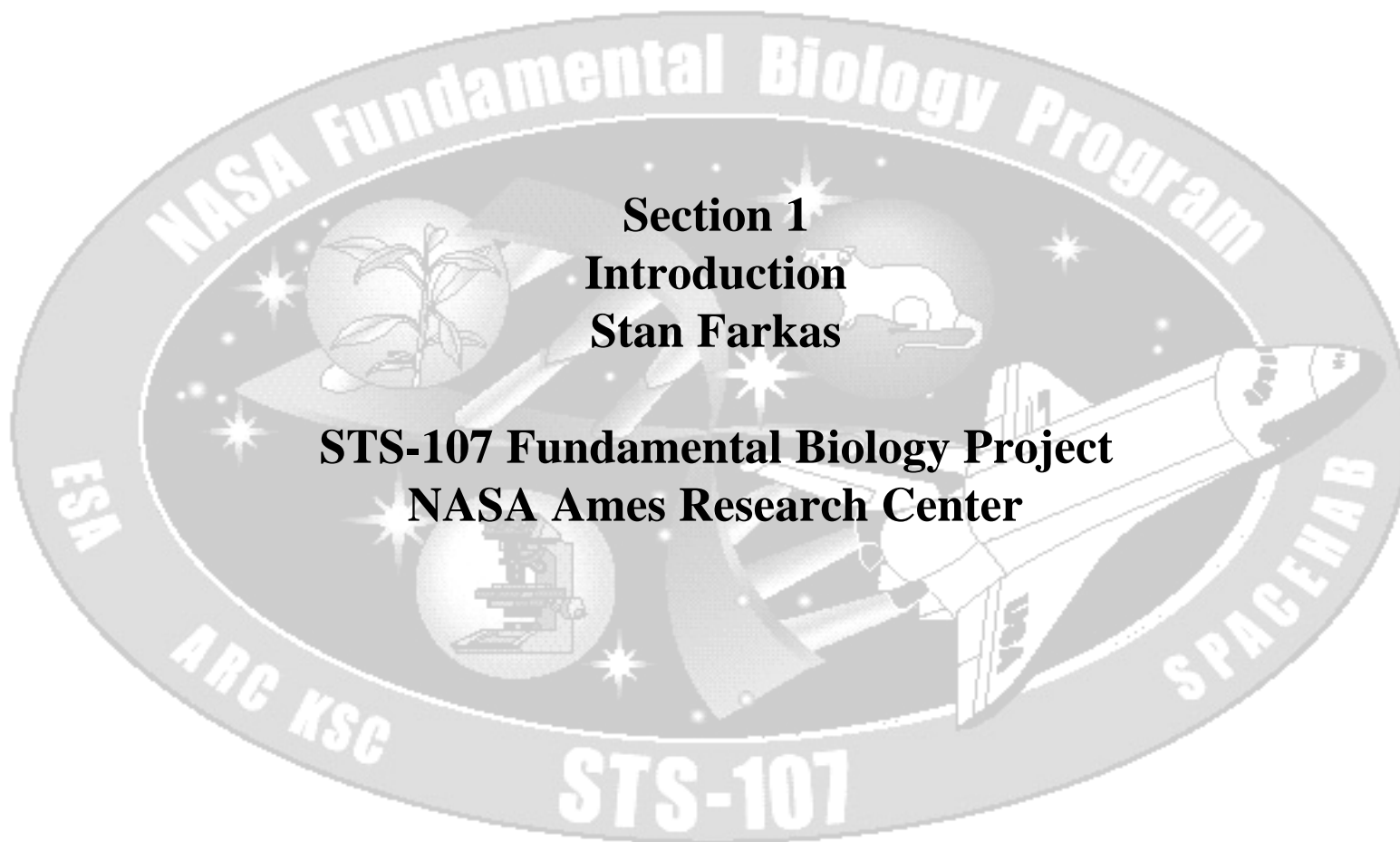


## Agenda



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<b>11) Project Stowage</b>	<b>Fernando Revilla</b>
<b>12) Verification</b>	<b>Selim Ibrahim</b>
<b>13) SS&amp;MA</b>	<b>Keith Jaquillard</b>
<b>14) Lessons Learned</b>	<b>Stan Farkas</b>
<b>15) Risk Management</b>	<b>Stan Farkas</b>
<b>16) Development Status</b>	<b>Stan Farkas</b>
<b>17) KSC - Hasenstein</b>	<b>April Boody</b>
<b>18) KSC - Sack</b>	<b>Roberteen McCray</b>
<b>19) Summary</b>	<b>Stan Farkas</b>



**Section 1**  
**Introduction**  
**Stan Farkas**

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# Introduction



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- **Meeting Logistics**
  - **Purpose of Phase A/B Project Status Review**



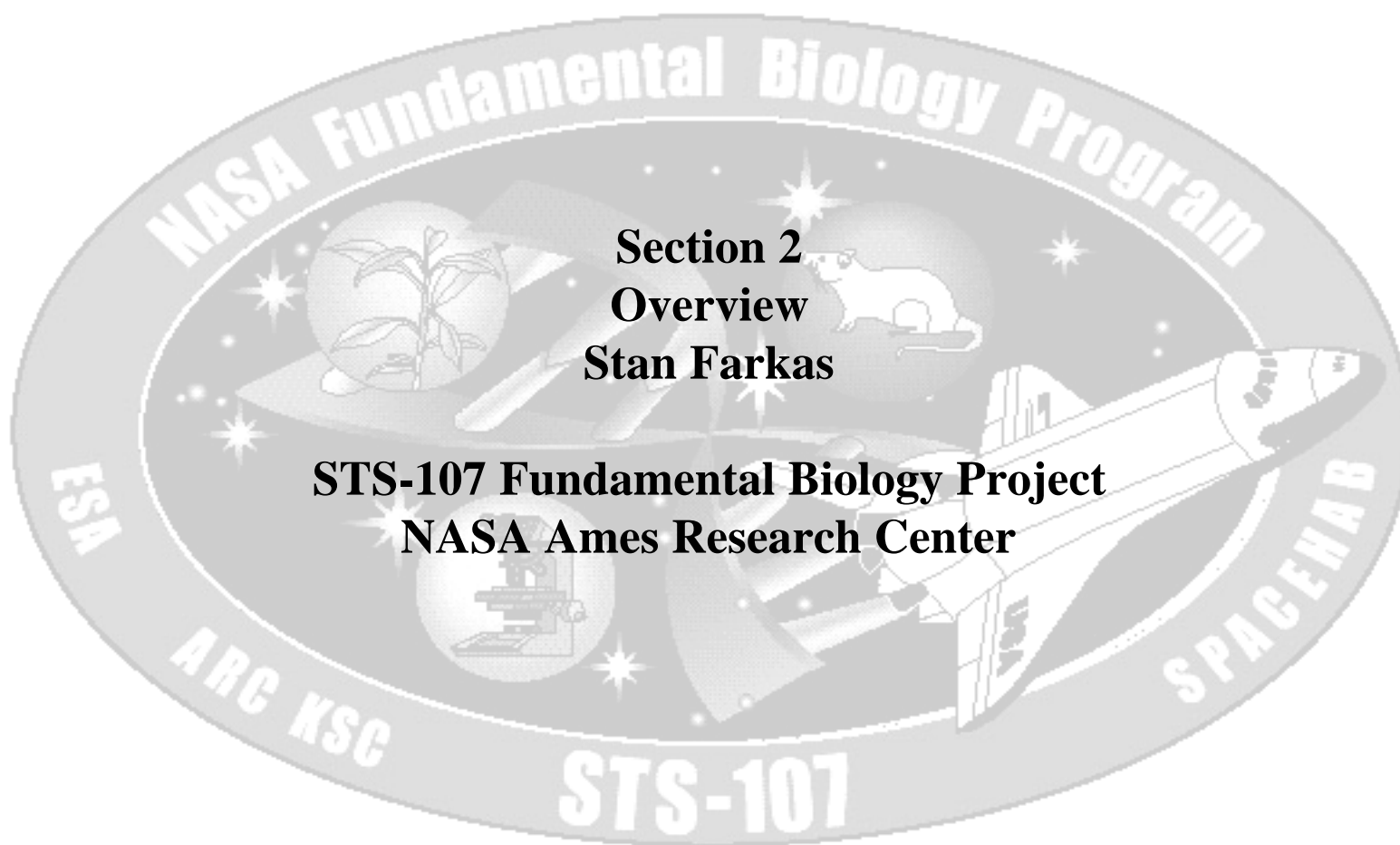
## Introduction



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# Phase A/B Project Status Review

- **Purpose:** To present the status of the project to NASA Ames management and other key personnel. Areas reviewed are defined in the agenda
- **Goal:** To obtain authority from the ARC Life Sciences Division Project Control Board to proceed to Project Phase C per ARC ISO Document AI-02319



**Section 2  
Overview  
Stan Farkas**

**STS-107 Fundamental Biology Project  
NASA Ames Research Center**



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## **STS-107 Fundamental Biology Project Mission Statement**

**To Facilitate Fundamental Biology Space Flight  
Research on Shuttle Mission 107 to Further  
Understand How Living Systems Respond to  
Microgravity**

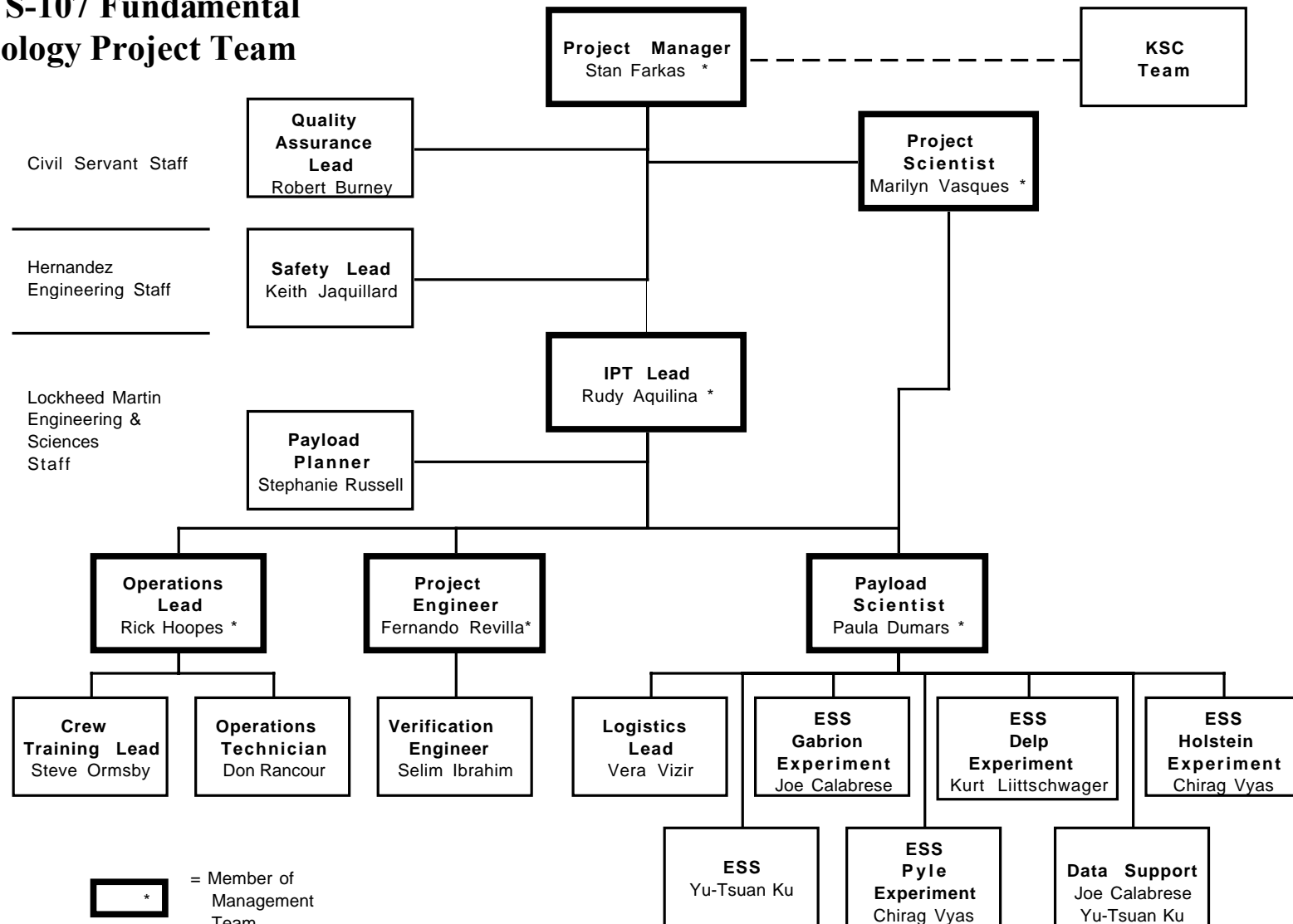




# Project Overview



## STS-107 Fundamental Biology Project Team



25 May 2000

STS-107 Project Phase A/B Review



## Project Overview



- **KSC STS-107 Team**

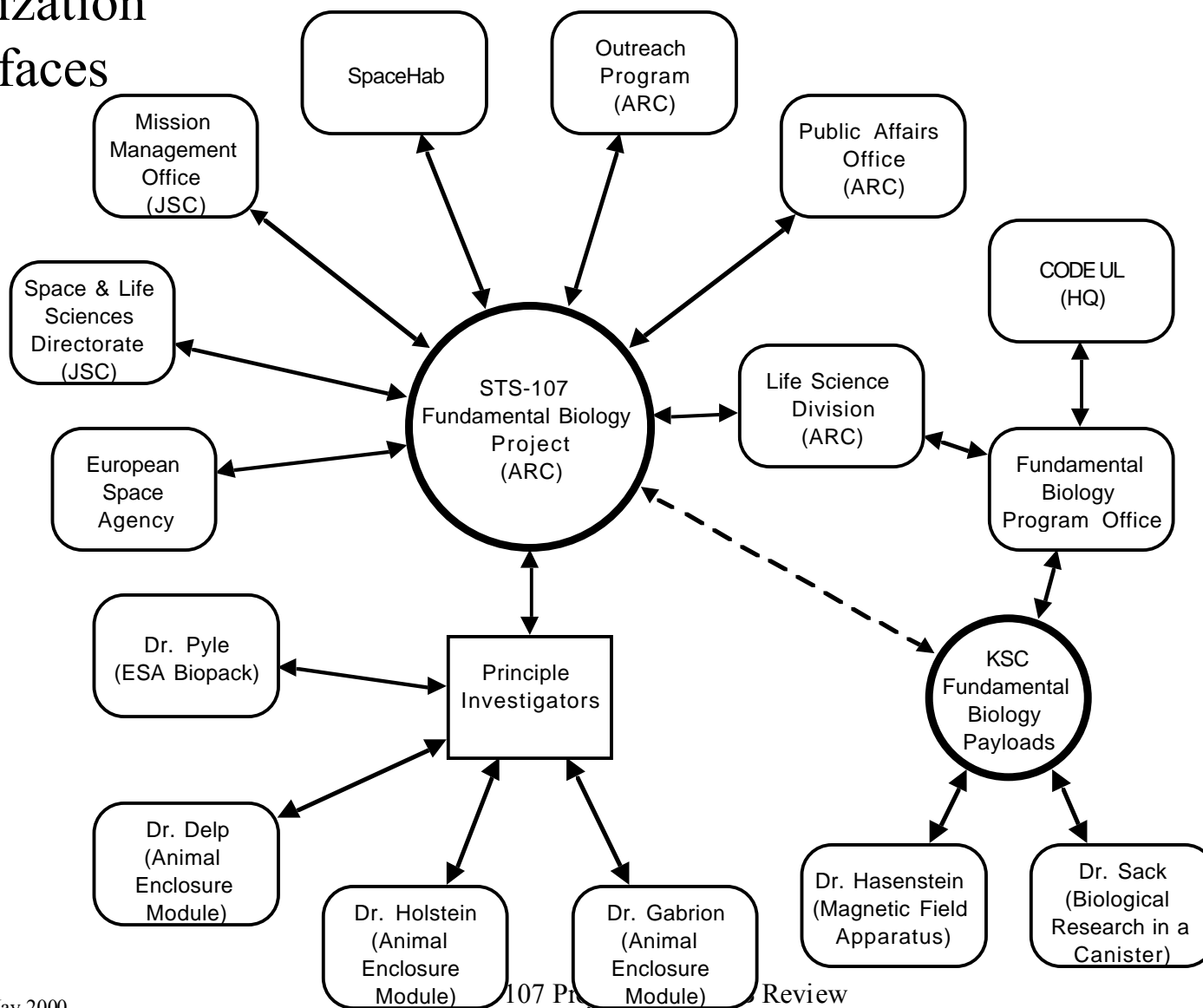
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|-------------------------------|---|
| ▪ <b>Guy Etheridge</b>        | <b>KSC Flight Experiments Lead</b>              |
| ▪ <b>David Cox</b>            | <b>Project Manager (Hasenstein Experiment)</b>  |
| ▪ <b>April Boody</b>          | <b>Project Engineer (Hasenstein Experiment)</b> |
| ▪ <b>Bridgit Higginbotham</b> | <b>Project Manager (Sack Experiment)</b>        |
| ▪ <b>Roberteen McCray</b>     | <b>Project Engineer (Sack Experiment)</b>       |



# Project Overview



## Organization Interfaces





## Project Overview



- **STS-107 Fundamental Biology Project Supports the NASA Strategic Plan**
  - **NASA Mission:**
    - ◆ **To advance human exploration, use, and development of space**
  - **Human Exploration and Development of Space Enterprise Goal:**
    - ◆ **Expand scientific knowledge**
  - **Fundamental Biology Program Goal**
    - ◆ **Effectively use the microgravity of space to enhance our understanding of the fundamental biological processes**



## Project Overview



- **Applicable Documents**
  - **NASA Policy Directive: 1000.1a. NASA Strategic Plan, 1998 with 1999 Interim Adjustments**
  - **NASA Procedures and Guidelines: 7120.5A. NASA Program and Project Management Process and Requirements**
  - **ARC ISO 9001 Document: SLO-01, Space Flight Project Management Process**
  - **ARC ISO 9001 Document: AI-02319, Project Phase/Design review Process**
  - **STS-107 Fundamental Biology Project Plan**
  - **TBD NASA/SPACEHAB Buy-Back Agreement**



## Project Overview



- **Customers**
  - **Principle Investigators**
    - ◆ **Michael Delp, Ph.D.**
    - ◆ **Gay R. Holstein, Ph.D.**
    - ◆ **Jacqueline Gabrion, Ph.D.**
    - ◆ **Barry H. Pyle, Ph.D.**
    - ◆ **Fred D. Sack, Ph.D.**
    - ◆ **Karl H. Hasenstein, Ph.D.**
  - **NASA Code UL**
  - **NASA Fundamental Biology Project Office**
  - **NASA Mission Management Office**
  - **European Space Agency (ESA)**
  - **SPACEHAB**
  - **Public**



## Project Overview



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- **Project Planning Activities and Products**
    - **Team Development**
    - **Organization Chart**
    - **Project Plan**
    - **Project Schedules**
    - **Risk Management Plan**
    - **Verification Plan**
    - **SS&MA Plan**
    - **Lessons Learned Assessment**
    - **Submittal of inputs to Program Operating Plan (POP)**

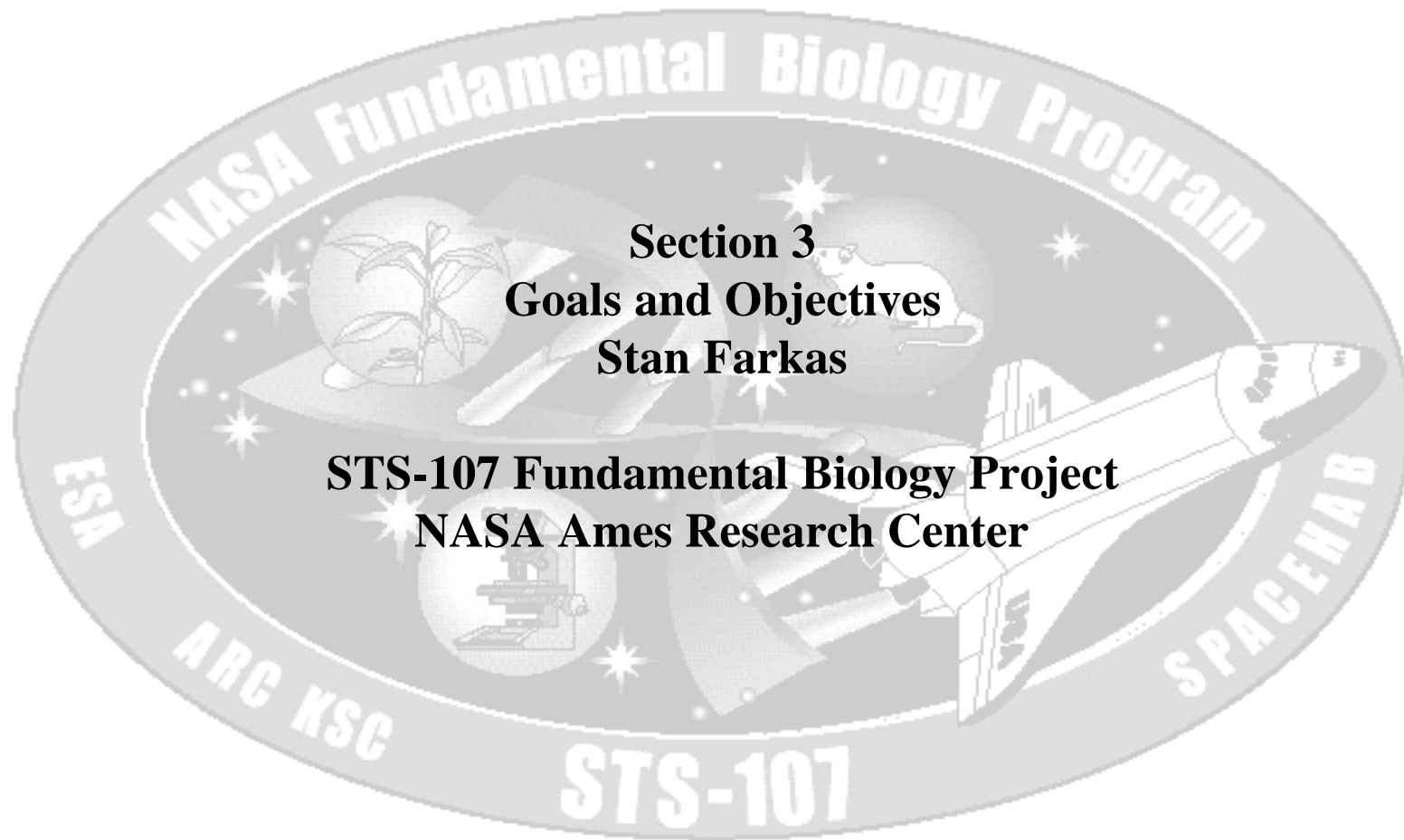


## Project Overview



- **Assumptions**
  - **Fundamental Biology payloads are manifested on STS-107**
    - ◆ **NASA/SPACEHAB Buy-Back Agreement is Baselined**
  - **Launch date is 4-19-01**
  - **Work to the following SPACEHAB schedules to establish milestones and deliverable dates:**
    - ◆ **STS-107 Schedule dated 4-21-00, Launch date 2-22-01**
    - ◆ **STS-107 Preliminary Training Schedule Rev. B (Launch 2-22-01) dated 4-6-00**
  - **Fundamental Biology payloads are included on STS-107 Time-line**
  - **Resource allocations required to support Fundamental Biology payloads will be provided by SPACEHAB**
    - ◆ **Locations for AEMs, BRIC, MFA/Biotube**
    - ◆ **Stowage volume**
    - ◆ **Power**
    - ◆ **On-orbit crew time**
    - ◆ **Crew time for training**





**Section 3  
Goals and Objectives  
Stan Farkas**

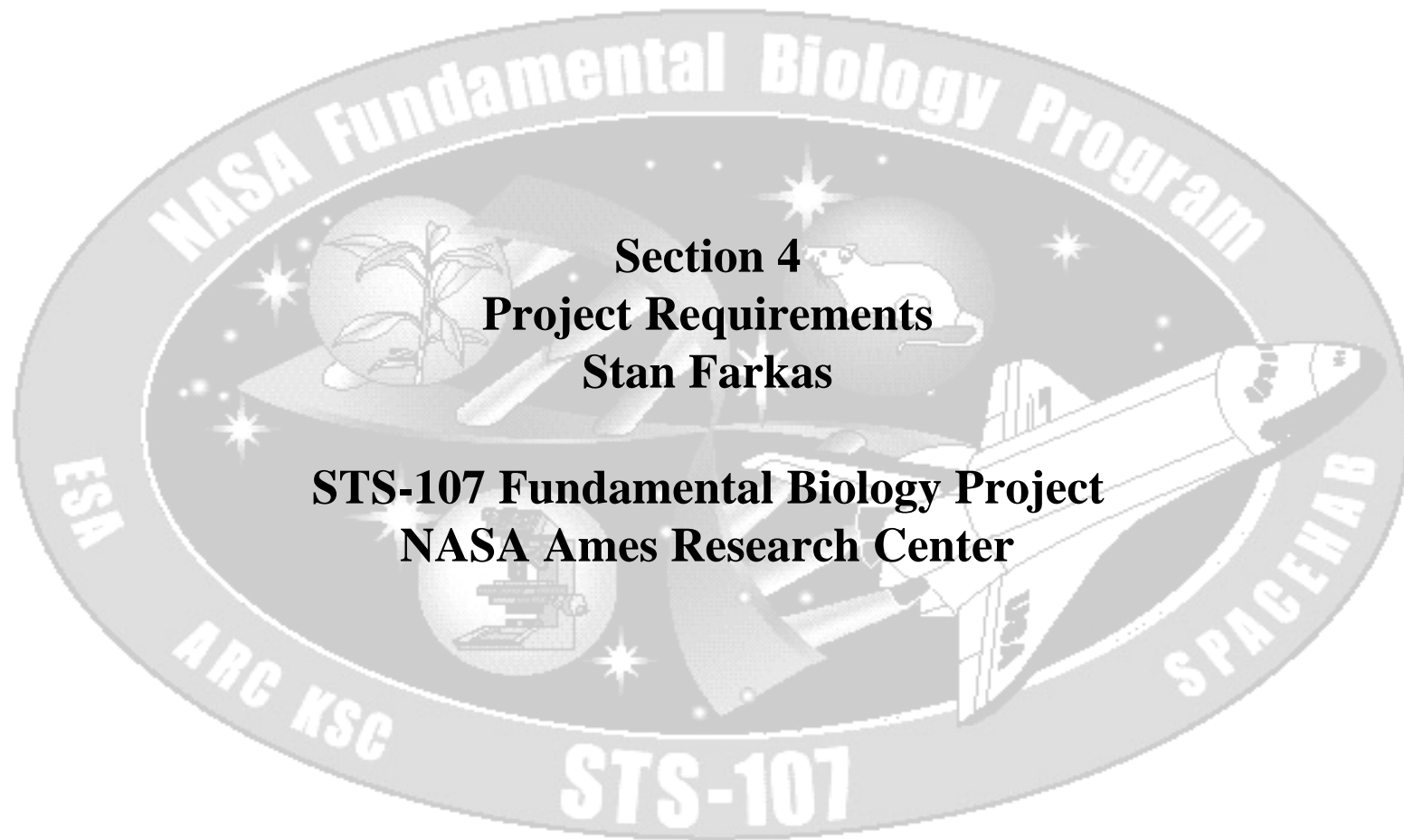
**STS-107 Fundamental Biology Project  
NASA Ames Research Center**



## Goals and Objectives



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- **STS-107 Project supports the Fundamental Biology Experiments that have been manifested on the STS-107 flight.**
  - **The STS-107 Fundamental Biology Project Goals can be summarized as follows:**
    - **Maximize science research return to each investigator**
    - **Conduct research to the highest standards**
      - ◆ Confirm Ames Life Science credibility for conducting life sciences research
    - **Build upon and enhance external project interfaces**
      - ◆ Effectively manage multiple external project interfaces
    - **Maintain cost effective resource budget management in the areas of manpower, travel, and materials**



**Section 4  
Project Requirements  
Stan Farkas**

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## Project Requirements



- **Top Level Requirements**
  - **Primary Fundamental Biology Project Requirements**
    - ◆ **Support research on-orbit utilizing the following platforms:**
      - § **AEM - Animal Enclosure Module (ARC)**
      - § **Biopack (ESA)**
      - § **MFA/Biotube - Magnetic Field Apparatus (KSC)**
      - § **BRIC - Biological Research in a Canister (KSC)**



## Project Requirements



- **Top Level Requirements (Continued)**
  - **Project Management Requirements**
    - ◆ **Sufficient resources (funds and personnel) shall be provided to maximize probability of mission success.**
      - ₪ **Criteria: Sufficient funds and personnel have been allocated to the project.**
    - ◆ **Project planning shall be conducted to maximize probability of mission success.**
      - ₪ **Criteria: Project Planning activities and products have been developed.**



## Project Requirements



- **Top Level Requirements (Continued)**
  - **Hardware Requirements (AEM/Biopack)**
    - ◆ **AEM H/W design and operations shall meet science requirements as defined in individual Experiment Requirements Document (ERD).**
      - ₪ **Criteria: AEM hardware maintains the health and welfare of adult rats in microgravity as demonstrated in past flights.**
    - ◆ **AEM CO<sub>2</sub> System shall provide the crew with a safe and rapid means of euthanizing rodents in the event of an animal crisis.**
      - ₪ **Criteria: The system will be tested and validated prior to flight.**
    - ◆ **Biopack hardware shall meet science requirements as defined in the ERD.**
      - ₪ **Criteria: Successful completion of Experiment Sequence Test.**



## Project Requirements



- **Top Level Requirements (Continued)**
  - **Science Requirements**
    - ◆ **Experiment designs shall be defined**
      - ₪ **Criteria: Experiment Requirements Document have been written, released & baselined.**
    - ◆ **Experiment design shall be approved**
      - ₪ **Criteria: Authority to proceed from ARC Life Sciences Division Project Control Board.**
    - ◆ **On-Orbit operations shall be conducted**
      - ₪ **Criteria: Completion and implementation of preflight preparations and mission timeline.**
    - ◆ **Experiment data shall be disseminated to PI teams**
      - ₪ **Criteria: Post-flight samples are received by PIs.**



## Project Requirements



- **Top Level Requirements (Continued)**
  - **Operations Requirements**
    - ◆ **Hardware shall be fabricated, modified, and refurbished to meet objectives identified in the Experiment Requirement Documents.**
      - ₪ **Criteria: Turnover flight hardware to SPACEHAB prelaunch.**
    - ◆ **Hardware shall be prepared to support crew training.**
      - ₪ **Criteria: Completion of dry runs and hands on training.**
    - ◆ **Training of crew shall be supported by STS-107 Fundamental Biology Project personnel.**
      - ₪ **Criteria: Release crew training proficiency criteria.**
  - **Safety Requirements**
    - ◆ **The identification and mitigation of hazards shall be accomplished to achieve mission success for the STS-107 SPACEHAB mission.**
      - ₪ **Criteria: Completion of Payload Safety Process (Phase review cycle)**





## Project Requirements



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## Master Schedule

Available  
at review



## Project Requirements



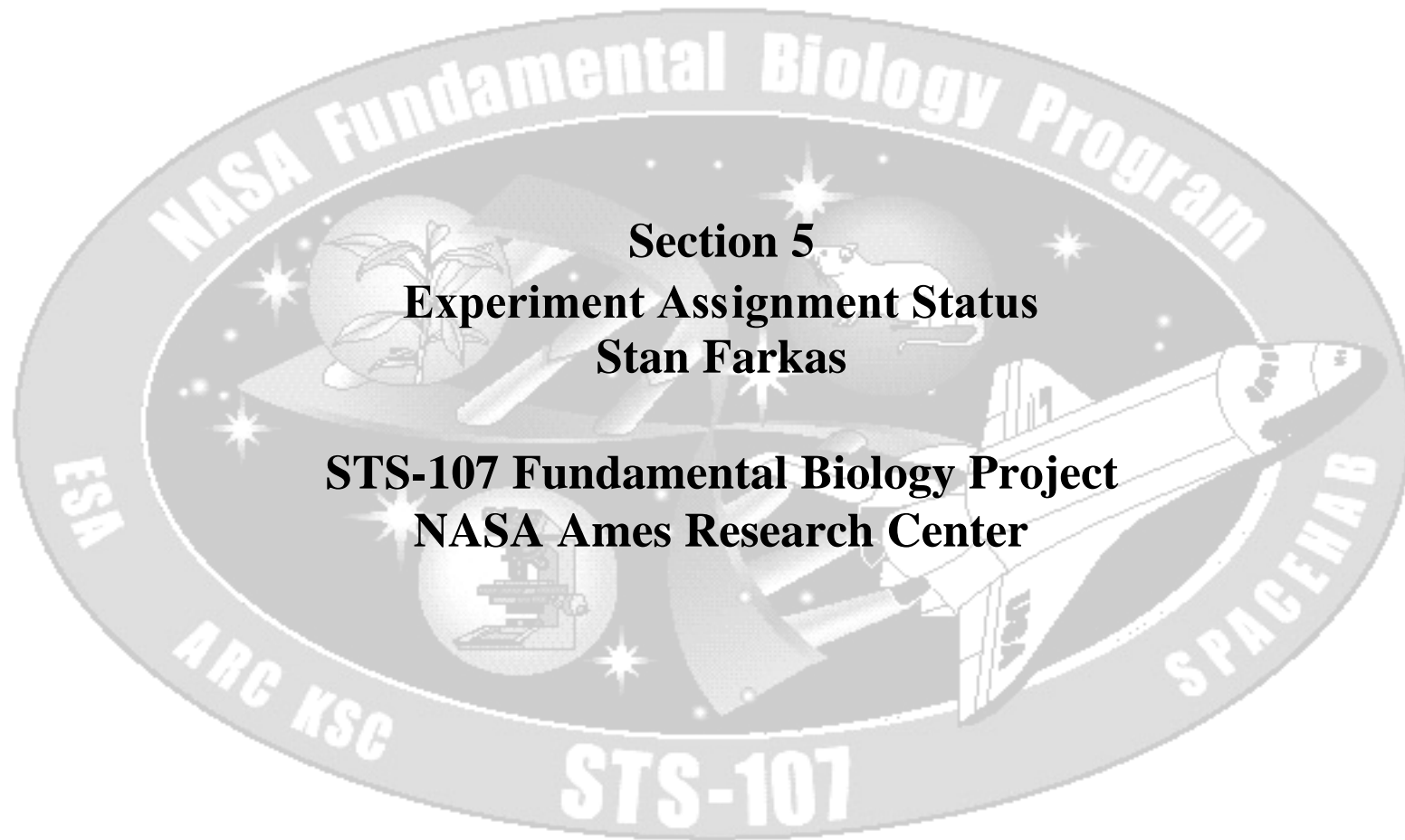
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- **Schedule (Continued)**
    - **Network Diagram (in meeting room)**
    - **Gantt Chart (in meeting room)**



## Project Requirements



- **List of Deliverables**
  - **Generic SPACEHAB Deliverable Schedule (available at review)**
- **Resources (materials, facilities, personnel)**
  - **ARC- Payload Receiving Facility for all PI teams, ARC facilities as needed for PI teams, staff /materials/equipment/ flight hardware for FRESH-02, staff/materials/equipment for Pyle**
  - **KSC-Launch Site Support Facility-preflight/postflight facilities for all PI teams, staff/materials/equipment/flight hardware for Sack/Hasenstein,**
  - **ESA-Flight H/W and integration for Pyle**
  - **SPACEHAB-Integration for all PI experiments**



**Section 5**  
**Experiment Assignment Status**  
**Stan Farkas**

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## Experiment Assignment Status



- **Fundamental Rodent Experiments Supporting Health (FRESH-02)**
  - **Arterial Remodeling and Functional Adaptations Induced by Microgravity; Michael Delp, Ph.D. , Texas A&M University**
    - ◆ **Hardware: Animal Enclosure Module**
    - ◆ **Status: Funded; Manifested per Buy-Back Agreement**
  - **Anatomical Studies of Central Vestibular Adaptation: Neurolab Completion Proposal; Gay R. Holstein, Ph.D., Mt. Sinai School of Medicine**
    - ◆ **Hardware: Animal Enclosure Module**
    - ◆ **Status: Funded; Manifested per Buy-Back Agreement**
  - **Choroidal Regulation Involved in the Cerebral Fluid Response to Altered Gravity; Jacqueline Gabrion, Ph.D., CNRS, Paris (CNES/ESA)**
    - ◆ **Hardware: Animal Enclosure Module**
    - ◆ **Status: ESA Funded; Manifested per Buy-Back Agreement**



## Experiment Assignment Status ARC Stowage Hardware\*



CO<sub>2</sub> Modifications not shown



## Experiment Assignment Status AEM CO<sub>2</sub> Storage Assembly



### Prototype



## Experiment Assignment Status AEM CO<sub>2</sub> Umbilical Assembly

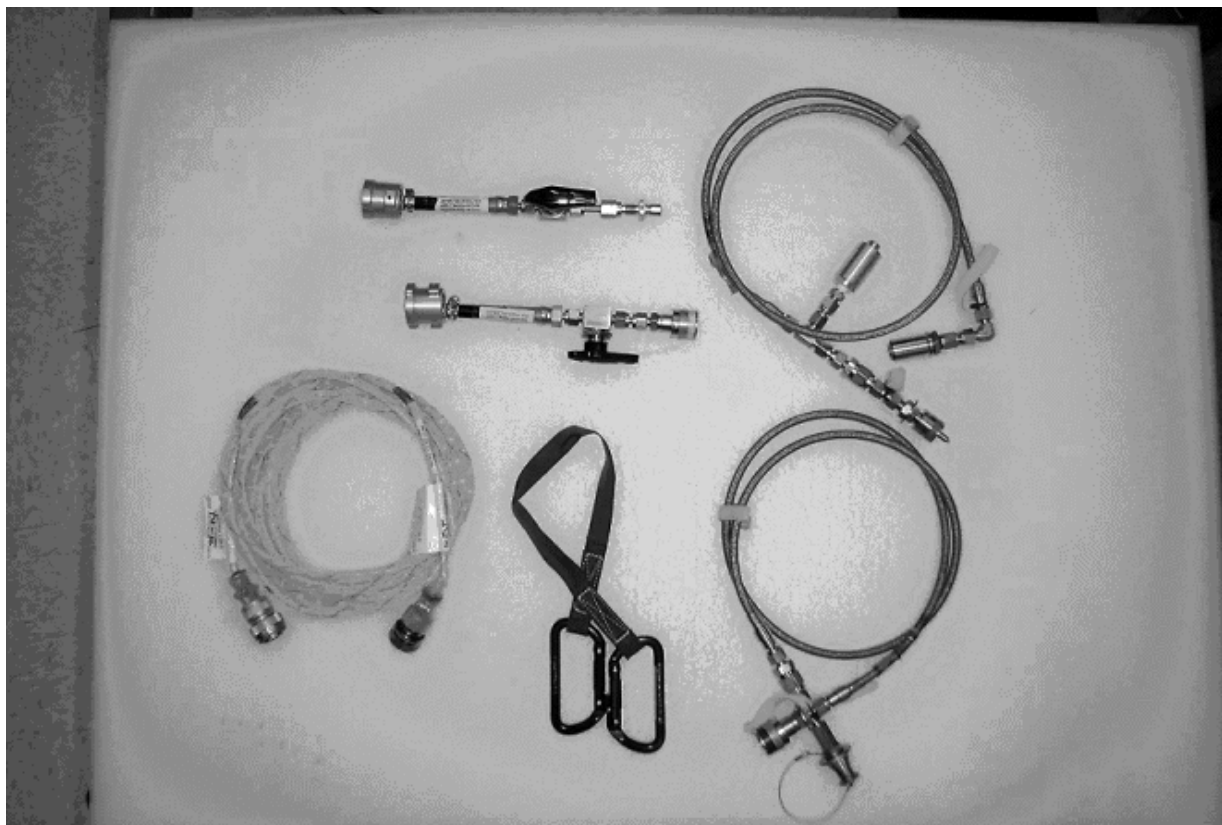


**Prototype**



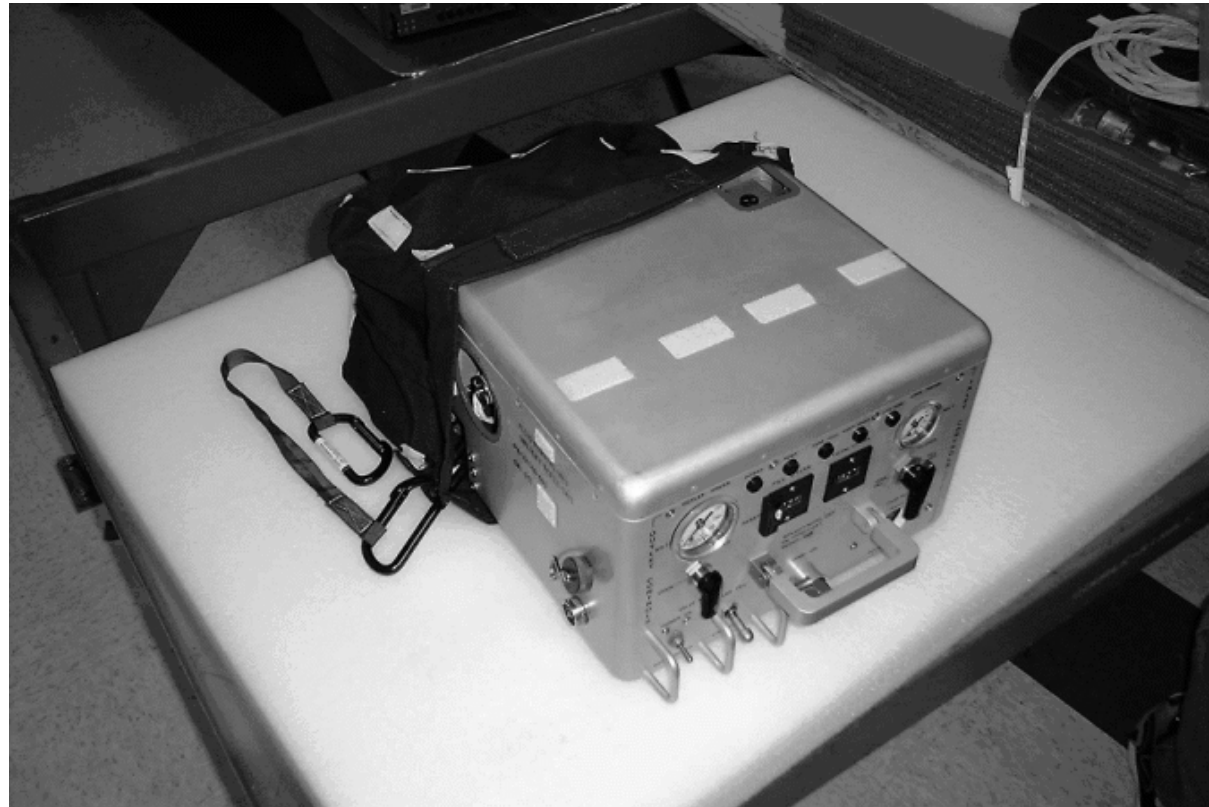


## Experiment Assignment Status IRU Accessories





## Experiment Assignment Status Inflight Refill Unit (IRU)





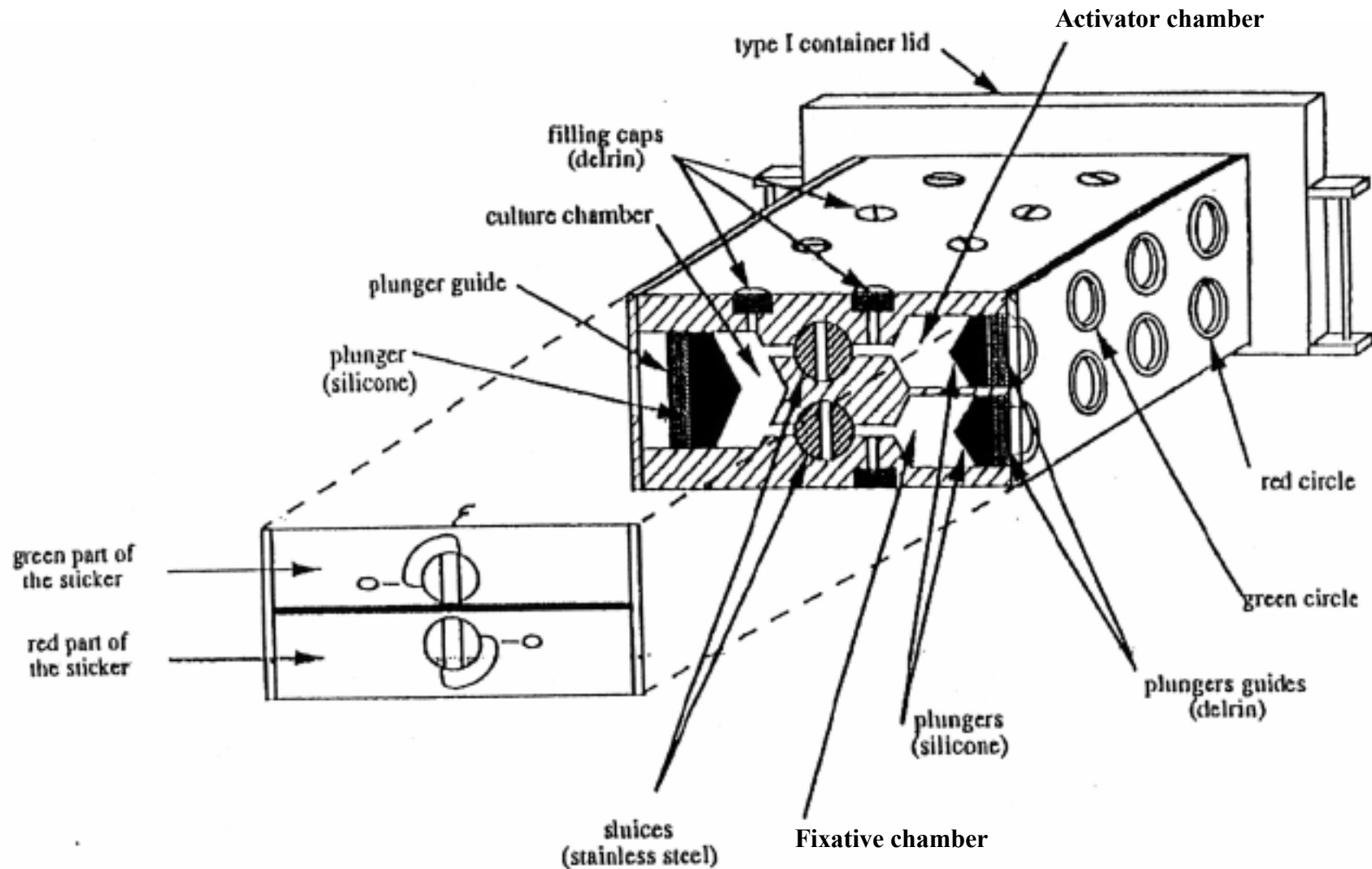
## Experiment Assignment Status

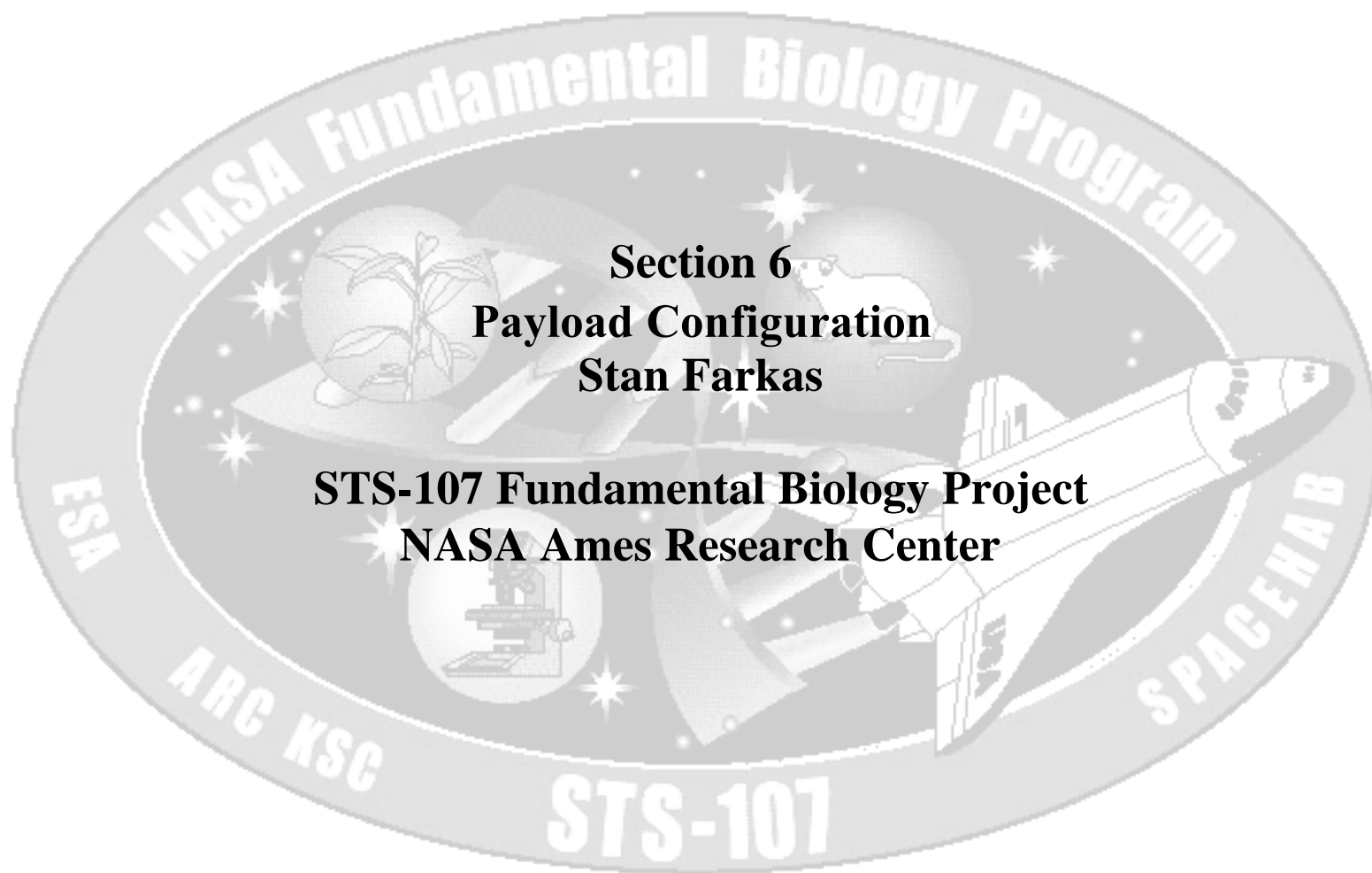


- **Bacterial Physiology and Virulence on Earth and in Microgravity;**  
**Barry H. Pyle, Ph.D., Montana State University, Bozeman**
  - **Hardware: Biopack (ESA hardware)**
  - **Status: Funded; Manifested**
  
- **Development of Gravity Sensitive Plant Cells in Microgravity;**  
**Fred D. Sack, Ph.D., Ohio State University**
  - **Hardware: Biological Research in a Canister (BRIC)**
  - **Status: Funded; Manifested per Buy-Back Agreement**
  
- **Application of Physical & Biological Techniques in the study of the Gravisensing and Response System of Plants;**  
**Karl H. Hasenstein, Ph.D., University of SW Louisiana**
  - **Hardware: Magnetic Field Apparatus (MFA/Biotube)**
  - **Status: Funded; Manifested per Buy-Back Agreement**



## Experiment Assignment Status ESA Biopack - Phorbol Unit





**Section 6**  
**Payload Configuration**  
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## ARC Payload Configuration



- **AEM**
  - **AEMs house the three FRESH-02 experiments and are located on the Forward Bulkhead in SPACEHAB. Final location for ancillary stowage has yet to be finalized, but it is expected to be in SPACEHAB.**
- **ESA Biopack**
  - **The Biopack facility and stowage lockers are located in the Middeck. (ESA is responsible for turning over fully integrated unit.)**
- **BRIC**
  - **The BRIC experiment is located in the Middeck**
- **MFA/Biotube**
  - **MFA/Biotube experiment is located on the Aft Bulkhead in SPACEHAB.**



## Payload Configuration

